DOCUMENT RESUME

ED 427 756 IR 019 407

AUTHOR	Pierce, Anne F.
TITLE	Improving the Strategies High School Students Use To Conduct Research on the Internet by Teaching Essential Skills and Providing Practical Experience.
PUB DATE	1998-05-00
NOTE	86p.; Ed.D. Practicum Report. Nova Southeastern University.
PUB TYPE	Dissertations/Theses - Practicum Papers (043) -- Reports - Research (143) -- Tests/Questionnaires (160)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	High School Students; High Schools; *Information Skills; Instructional Development; Instructional Material Evaluation; *Internet; Learning Modules; Material Development; *Online Searching; Questionnaires; *Research Skills; Search Strategies; Secondary School Teachers; Skill Development; *Student Research; Student Surveys; Teacher Surveys; Workshops
IDENTIFIERS	Boolean Logic; Search Engines; Web Sites

ABSTRACT

Objectives of this practicum were to: increase student knowledge of how to use the Internet to carry out research; improve the competency of teachers, thereby enabling them to teach students to use Internet resources; and develop an instructional unit that could be used by students, teachers, and librarians to facilitate use of the Internet to conduct research. Two teacher workshops on search strategies were presented. An instructional unit was developed that included notes on search engines and subject directories, lesson plans, notes on search strategies, a think/pair/share activity, an on-line search form, a pre/post test of student knowledge, and an Internet evaluation form to assess the validity and reliability of the information found. The instructional unit was used with 15 special education and 26 honors level high school students. Thirty-one teachers participated in the workshops; the 26 teachers who completed the evaluation form agreed the information was relevant and they would use it with their own students. Subsequent to instruction and guided practice, student performance in using the Internet as a resource, as measured by a comparison of pre/post test scores, improved significantly. Appendices include questionnaires, newsletters, evaluation forms, a copy of the instructional unit, and useful World Wide Web sites. (Contains 32 references.) (AEF)

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ED 427 756

Improving the Strategies High School Students Use to Conduct Research on the Internet by Teaching Essential Skills and Providing Practical Experience

by
Anne F. Pierce
Cluster 83

A Practicum I Report Presented to
the Ed.D. Program in Child and Youth Studies
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Nova Southeastern University
1998

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APPROVAL PAGE

This practicum took place as described.

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This practicum report was submitted by Anne F. Pierce under the direction of the adviser listed below. It was submitted to the Ed.D Program in Child and Youth Studies and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

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Acknowledgments

This project could not have been completed without the assistance of many people. A special thank you to my husband Clark E. Pierce for his tolerance of the demands on my time, his support, and his tangible help; especially all those times he cleaned up the kitchen. My son, Curtis E. Pierce, regularly took an interest in the project and provided encouragement which I appreciated. I am also grateful to my mother-in-law, Mary R. Senk. If she had not baby-sat for me all those years ago when I was earning my Associates Degree, I might never have reached this level. A special thank you to my colleagues, Rich Hartman, Lisa Cooper, Kathy McCormick, Tom Sundheimer, and Donna Leatherman for their assistance. Finally, I am grateful to Dr. Barbara Christina for helping me to refine my thoughts and guiding me through the entire practicum. I will always remember her dedication and professionalism.

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Abstract

Improving the Strategies High School Students Use to Conduct Research on the Internet by Teaching Essential Skills and Providing Practical Experience. Pierce, Anne F., 1998: Practicum Report, Nova Southeastern University, Ed.D. Program in Child and Youth Studies. Computer Uses in Education/Internet/Educational Innovation/Educational Technology/Secondary Education/Access to Information.

This practicum was designed to increase student knowledge of how to use the Internet to carry out research. It was also developed to improve the competency of teachers, thereby enabling them to teach their students to appropriately use the resources available on the Internet. The final objective was to develop a relevant instructional unit which could be used by students, teachers, and librarians to facilitate the use of the Internet to conduct research.

Two teacher workshops were presented which taught searching by keyword as well as by subject, the use of Boolean logic, and the use of wildcard characters. An instructional unit was developed. It includes: (a) notes on search engines and subject directories, (b) lesson plans, (c) notes on search strategies, (d) a think/pair/share activity, (e) an on-line search form for use prior to searching to determine appropriate strategies and resources, (f) a pre/post test of student knowledge and, (g) an Internet evaluation form to assess the validity and reliability of the information found. The instructional unit was used with a total of 41 students; 15 of whom were classified special education, and 26 of whom were honors level students.

Thirty one teachers participated in the workshops. The 26 teachers who completed the evaluation form all agreed the information was relevant to them and they would use it with their own students. Subsequent to instruction and guided practice, student performance in using the Internet as a resource, as measured by a comparison of pre/post test scores, improved significantly. The mean score of the 15 special education students improved by 37 out of a 100 points from the pre-test to the post test. The honors level students increased an average of 44 out of a 100 points. Improvement for the group as a whole was 41 points. Correlation coefficients for the pre/post tests were 0.51 for the special education group, 0.35 for the regular education students, and 0.68 for the group as a whole. This does not reach 0.85, the goal for this study. However, it does indicate a positive relationship between the tests and provides affirmation that students' scores will improve through teaching them about searching on the Internet and providing them with practical experience.

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Chapter I: Introduction

Description of Community

The sending districts for the regional high school in which this writer works are three communities which differ greatly in their demographics. These communities are located in the Northeastern United States. They are in a state which values local autonomy; hence, schools are funded by the town in which they are located. Some towns have their own high school, others send their high school age students to a regional high school. Regional high school districts receive students from more than one town. The towns pay tuition on a per pupil basis. The student body of the regional high school in which this writer teaches is made up of students from three sending districts which have diverse ethnic, social, and economic demographics. The largest and most affluent community has a population of 29,000 and is the source of 66% of the students. This community has a solid tax base comprised of many large corporate centers along with other businesses, some industries, and many retail sales operations including a large shopping mall. With one exception, it is a prestigious, affluent residential community which regularly votes for school funding and is willing to spend the amounts necessary to provide quality education.

The one exception in this first community is a large complex of apartments which surround the shopping mall. Those residents tend to be struggling financially and generally do not get involved with matters regarding the school district. With very few exceptions, the non-Caucasian students come from this first community. The next largest community has population of 11,000 which is a combination of middle and working class residents; it is the source of 22% of the student body. This second community has only one small shopping center and is primarily dependent on property taxes assessed on homeowners to fund education. The residents of this community apparently feel the cost

awareness counselor, and fifteen administrative personnel. Administrative personnel includes six central office staff, two building level principals and five vice principals. In the case of supervisors, coordinators, and directors, one person may fill more than one position.

The work setting is unique among public high schools in that state of the art technology is readily available within the schools. An interview with the Technology Coordinator yielded information regarding the availability of technology to students and teachers in each school and within the district as a whole. Each school has a fully equipped computer lab housed in its respective Media Center which is equipped with nineteen computers linked to the Internet and four computers without Internet connection. Each media center also has CD-ROMs which contain abstracts, and full text articles which are updated quarterly. Media Center computers are chiefly used by students who report to the lab in place of going to study hall; although, teachers can sign up to bring classes in to use the labs for research and preempt their use by study hall students.

Each school has two computer classrooms used for art department graphics courses, computer department, and business department courses; each of these classrooms contains twenty computers. Departmental Computer Labs are used by both schools and teachers sign up in advance to use them. The English and Math Labs each have twenty computers. The Science Lab has six computers. In addition, an interdepartmental lab is set up in each school; each of these labs has one scanner and twenty computers, all of which are connected to the Internet.

Some science, gifted and talented, special education, and basic skills classrooms have computers housed within the confines of the classroom. Three science classrooms are equipped with one computer each; these computers are tied into the Internet. Two gifted and talented classrooms have four computers each. Four special education classrooms have two computers each. Seven special education classrooms have one

computer each. CD-ROMs are available in a variety of settings within the district. As previously mentioned, each media center has four computers with CD-ROM capabilities. One special education classroom is equipped with CD-ROM which is used primarily for research with software such as Encarta. Three basic skills classrooms have one computer per room and a drafting class, in which CAD (computer aided design) classes are taught, is equipped with three computers.

The use of classroom computers is determined by the individual teachers. The student:computer ratio for the district as a whole is 8:1. In addition to the computers available for student use, each of the five teachers rooms is equipped with two computers, both of which have access to the Internet. Only one computer lab is more than five years old. The district also has its own television studio which is operated by a teacher, a technician, and students.

Writer's Role

This writer has a Bachelor of Science in Business Administration with an Accounting Major and Computer Science Minor, and has completed a Post Baccalaureate Teacher Certification Program. She also has a Master of Arts in Special Education, and is currently pursuing a Doctor of Education in Child and Youth Studies. This writer has been employed by the regional school district cited above for the past ten years as a teacher. In any given year, this writer teaches courses for one or more of the following departments: Business, Computer Science, Special Education, and/or the Mathematics Departments. Courses taught include, but are not limited to, Business Math, Consumer Math, Introduction to Computer Science, Computer Applications, Business Technologies, Keyboarding, Wordprocessing, Resource Center Support, Programming in BASIC, and Programming in C++. Most of the courses this writer teaches are electives; therefore, teaching assignments are based on fluctuating enrollments. In addition, this writer has

been a Student Council advisor for eight of the past ten years.

Chapter II: Study of the Problem

Problem Statement

The problem to be solved in this practicum was that students were not able to effectively use the Internet to do research.

Problem Description

Students were not using effective search strategies when using the Internet to perform research. They were not doing the appropriate planning prior to conducting a search; nor were they taking the time after their search to evaluate the validity of the materials they did acquire. Most students were not using Boolean logic. Also, they had not learned that searching by keyword rather than by subject is generally more productive. Students were not using wildcards to facilitate searches. Students got lost in cyberspace in that they tended to take repeated side trips to sites which were not related to their research topic. Students felt they were doing a good job because they were generally able to retrieve a great deal of information when they used the Internet. Although, at first, they may have enjoyed the profusion of data available, as they got more deeply involved they became overwhelmed by the great quantity of information they were able to generate with their indiscriminate searching. Students were usually able to retrieve some relevant information using the Internet to do research; consequently, they had the mistaken belief that they possessed the requisite skills to do research effectively.

Each fall, students are provided with an orientation session in the media center which includes a small segment on doing research using the Internet. The orientation is conducted by the librarian. This session is conducted in isolation and may or may not be reinforced by classroom teachers. Most teachers were unable to do research using the Internet; therefore, they were unable to provide reinforcement for the orientation and

unable to assist their students with any difficulties the students encountered when using the Internet to do research. Teachers have been provided with a variety of mandatory computer related in-service training, usually during one half to two of the in-service days provided each school year. In addition, after school sessions have been provided on diverse computer uses; attendance at these sessions is voluntary. In these after school sessions, E-mail, wordprocessing, computerized grading software, and numerous other computer uses have been explored. Conducting research on the Internet had not been addressed. All of the after school workshops and most of the computer related in-services have been conducted by members of the school staff. A workshop on using the Internet to conduct research had not been presented because no one on staff had explored the topic sufficiently to prepare the resources and materials which would be necessary. Therefore, the teachers had not had an opportunity to learn Internet research skills and in turn were unable to teach their students how to effectively use the resources available on the Internet.

Problem Documentation

In the spring of 1997, the 117 teachers employed by the district were surveyed by this writer (see Appendix A). Forty three teachers responded. A compilation of the responses submitted indicated that while many students used the Internet, very few of them did research effectively. The teachers were asked what skills it would be helpful for their students to have when conducting research on the Internet. Although the survey allowed for free responses, some patterns emerged from the answers. As depicted in Figure 1, 22 teachers felt their students had not learned to use directories and search engines. Thirteen indicated their students did not understand using keywords. Searching efficiently was cited by ten teachers. Evaluating the validity of materials obtained was referred to by nine of the teachers responding. Four did not address this question.

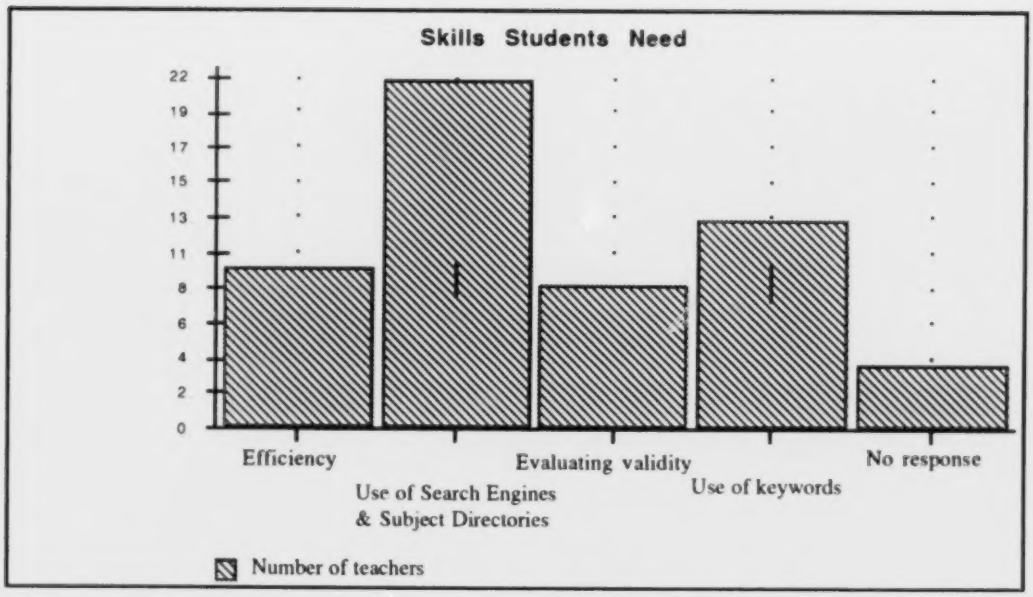


Figure 1: Teacher Assessment of Internet Research Skills Students Need

Moreover, eight teachers who responded to the survey also indicated that they did not know how to do research using the Internet and were, therefore, unable to instruct or assist their students. In this context it was interesting to note the way the teachers' responses were worded. Many of the teachers used phrasing such as "finding and using programs" when what they were actually referring to were search engines or subject directories. Only one of the teachers responding actually used the term keyword(s). The others wrote about "narrowing the search", "what type of words to enter", "topic search words", or "using the right words for the search". This observation provided support to the evidence gathered in interviews regarding the need to instruct the teachers in how to effectively use the Internet to conduct research.

In the spring of 1997, a 17 question pretest (see Appendix B) covering subject directories, search engines, and search strategies was administered to 66 students in grades 9 through 12 to obtain preliminary data. The results are as follows: (a) the highest score was 14 correct which compared favorably to the anticipated high score of 15; (b) the

lowest score was 0 correct; and, (c) the average score was 5.5 correct which compared unfavorably with an anticipated average score of 10. The test was divided into three sections: (a) questions 1 to 5 assessed student knowledge of subject directories, (b) questions 6 to 10 evaluated student knowledge of search engines, and (c) questions 11 to 17 assessed the students' knowledge of search strategies. The following statistics are based upon the average number of correct responses to the five to six questions in each category (see Table 1). An average 30 of 66 students answered the questions regarding subject directories correctly. This number is deceptively high. Fifty-five students answered question number one correctly. The question was: "Which of the following organizes Internet resources using the Dewey Decimal system?" and among the choices was CyberDewey. The answer appears to be readily discernible, therefore producing an artificially high correct response rate when compared to the other four questions in that category. Questions number two, three, four, and five produced 20, 37, 19, and 19 correct responses respectively. The other two topics produced more moderate ranges between the highest and lowest number of correct responses. Questions 6 through 10, which assessed student knowledge of search engines, produced a high of 26 and a low of 11 correct responses.

Question Numbers	Topic	Average Number of Students Answering Correctly
1 to 5	Subject Directories	30
6 to 10	Search Engines	16
11 to 17	Search Strategies	19

N=66

Table 1: Student Responses on Pretest

The results indicate students did not have basic knowledge of subject directories,

search engines, or search strategies. Fewer than half the students tested possessed the knowledge to choose an appropriate subject directory. Slightly under one fourth of the them were knowledgeable concerning search engines. Less than one third of the students tested were conversant with effective search strategies.

Causative Analysis

There appears to be several reasons students were unable to effectively use the Internet to do research. Each fall, the English classes are taken to the media center for orientation which includes a segment on doing research using the Internet. These sessions are conducted by the media center staff. During these orientations, large group instruction on using the Internet is provided to every student for one class session (45 minutes). Personal interviews with the media center staff indicated that the session covers the basics of using the Internet to do research; but, there is not sufficient time for the students to adequately apply the information provided. The students do not have time during the session to sufficiently explore the various subject directories and search engines. Nor, do the students have ample time to practice search strategies. These sessions did not provide the students with a framework for evaluating the validity and reliability of information obtained using the Internet. The media center staff does not conduct follow-ups. Subsequent use and reinforcement of what is learned depends on individual teachers.

Students felt they had the necessary skills to effectively do research on the Internet even though this was not accurate. A district wide survey of students conducted by the Technology Department (see Appendix C) found that 69% to 81% of students felt competent to do Internet research independently or with minimal assistance (Baldyga, 1997). The survey results were reported in a district publication. Written permission to use information in the publication was granted by the school district's Director of Technology (see Appendix D). The findings of the survey were refuted by the results of

interviews and the preliminary pretest of Internet knowledge which indicated that students wandered around in cyberspace and found data; however, they were unable to do research in a structured manner. Students were not doing the prior planning which would have resulted in an effective search. They did not have a formal structure for developing an effective plan. Nor, were they doing the post assessments which would have determined the reliability and validity of data gathered. Again, they had not been provided with a framework which would facilitate the assessment of data and its sources. Students, in doing unstructured searches, produced a wealth of data which gave them a false sense of having accomplished their task.

The vast quantity of data obtained in unstructured searches may have been overwhelming. Much of the data may have been irrelevant or invalid because students were not discriminating in their choice of web sites. Students were not differentiating between information posted at web sites developed by groups such as a sixth grade class and information posted at web sites such as EBSCO (Elton B. Stevens Company) Host which provides full text articles from periodic publications. Similarly, the interviews and pretest indicated students generally did not know how to use Boolean logic, keywords, or how to choose a search engine.

Students were not being systematically taught to effectively use the Internet to do research. When they were taught the necessary skills, the learning was not reinforced. They were introduced to these skills by the media center staff, but did not have sufficient reinforcement to become proficient or for the knowledge to stay with them. In the past, students used standard reference books which could be assumed to be reliable. This same assumption cannot be made about sources on the Internet. Students did not clearly understand that anyone with access to technology can post anything on the Internet. They were not being provided with the tools to evaluate the validity of either the data itself or the sources of data on the Internet.

In general, the teachers were unable to instruct students or to provide them with assistance. Because teachers did not know how to effectively use the Internet to do research, they were unable to provide reinforcement and follow up to the sessions conducted each fall in the media center. The inability of teachers to competently make use of the Internet was attributable to many factors. Training in the use of technology is a new component of teacher training programs. Older teachers were not conversant in the use of computers, never having had the opportunity to learn to use them in the past. Younger teachers may have received training; however, in many cases it was superficial and/or inadequate. Many teachers, young and old, found themselves ill equipped to deal with current demands to integrate technology into the classroom.

The time constraints a high school teacher deals with make it difficult to acquire computer skills independently. In this writer's work setting, teachers instruct five classes of 45 minutes each every school day. They have one 45 minute duty period performing tasks such as working in the attendance office or supervising in the cafeteria, a 20 minute lunch, and only one 45 minute period allocated for planning and preparation time. In addition, many of the teachers coach or sponsor activities. In view of the amount of time it takes to grade papers, meet administrative paperwork requirements, plan for classes, and do pre-class preparation such as photocopying and developing new materials, very little time is left. Without proper instruction and support, learning to use the Internet to conduct research was a formidable, time consuming task which was not amenable to self teaching in a few spare minutes here and there.

All the teachers on staff had been exposed to technology each school year when one half to two in-service days were dedicated to technology, and attendance was mandatory. In addition, voluntarily attended after school workshops are sporadically presented by staff members to address specific computer related topics. Using the Internet to conduct research had not been addressed at either the mandatory or voluntary

instructional sessions because, up until this practicum, no one on staff had systematically explored the topic and developed the necessary materials. Therefore, teachers had not had the opportunity to receive formal instruction in using the Internet as a resource.

In summary, the students thought they knew how to use the Internet to conduct research effectively because they were able to perform non-linear searches. Students were not being taught to use the Internet effectively to do research. When students were taught, the learning was not being reinforced. The majority of teachers did not possess the knowledge or skills to address this deficiency. This was a result of teachers not having access to opportunities to learn the skills themselves.

Relationship of the Problem to the Literature

The literature review provided insights regarding the problem. Students do not understand that gathering data on the Internet is only a small portion of the task. They are not doing the questioning and planning which should take place prior to actually gathering information. They are not recognizing how their choice of search engine or database will impact on what they do or do not receive as a result of their search (Tillman, 1997). Subsequent to gathering information, students are not performing sorting, sifting, synthesizing, and evaluation tasks (McKenzie, 1995).

During actual on-line time, students encounter a variety of obstacles. Students get lost in cyberspace while engaged in nonlinear browsing. McKenzie (1995) refers to the Internet as a "cumbersome information giant" (p. 8). Students find surfing the Net to be addictive, time-consuming, and/or unproductive because they do not know how to use appropriate search strategies. They are inclined to take repeated side trips to sites unrelated to their research topic. While such nonlinear searching may be valuable as a form of individual learning, it is an ineffective way to conduct research (McKenzie, 1995). Initially students may delight in the profusion of information they acquire; however, as

they progress, many students are overwhelmed by the sheer volume of data generated (Davis, 1995). McKenzie (1995) refers to this profusion of data as "info-glut" and states, "Unless students are taught the skills necessary to support the construction of new meaning, they are likely to skim along with little wisdom to show for their time and effort, but plenty of pages of info-glut" (p. 6). In addition, when left to their own devices, students are inclined to conduct simplistic searches. They type one or more keywords into the first white box they encounter in the first search engine or database they come across. In the context of simplistic searching, they also accept the system's defaults. Using this strategy in a small database is generally effective; however, in a large database it tends to produce many irrelevant documents (Barker, 1997). In addition, students lack sufficient skills to use Boolean logic. They are also unaware of the benefits of using it to focus their search (Short & Sproesser, 1993; McKenzie, 1995). Many common errors can be avoided by providing students with a command of Boolean operators.

Other factors, such as the lack of search forms and directories which provide guidance, are also elements of student inability to effectively perform searches. Without a search form to provide structure and guidance, students do not apply a thoughtful approach to the search strategies they employ (Minnich & McCarthy, 1986). Furthermore, a complete directory of resources which are available on the Internet does not exist; consequently, it can be difficult to find information.

The method of teaching search strategies in this writer's work setting was inadequate. The 45 minute class session with no follow up did not provide adequate learning opportunities for students to become proficient users of Internet resources. "Understanding content, search features, and systems at the conceptual level is not something that can be learned in a brief reference interaction" (Tenopir, 1997, p. 32).

Students did not realize that although the Internet has a lot to offer, presumptions of validity and reliability are imprudent (Grassian, 1997). The Internet is not the

responsibility of any one organization or governing body; therefore, it seems unlikely that uniform quality control measures will be established in the foreseeable future (Janicke-Hinchliffe, 1997). Students are not being taught to recognize the lack of uniform quality and that using state of the art technology is not equal to obtaining valid, reliable data. According to Pask, "Anyone can (and probably will) put anything up on the Internet. The information may or may not be reliable, accurate, and/or truthful" (p. 1). The data may or may not be meaningful, thoughtful, and/or researched (Pask, 1993). Neither formal review processes nor fact checking procedures are used to review information placed on the Internet; as a result some materials may be invalid, offensive, or even harmful. "Unlike most print resources such as magazines and journals that go through a filtering process (e.g. editing, peer review), information on the World Wide Web (Web) and the Internet is mostly unfiltered" (Scholz, 1996, p. 1). Lack of physical separation of sources on the Web further adds to student confusion. Students can move from one resource to another simply by clicking on the mouse button. This makes it difficult for students to differentiate between valid and invalid sources.

Most teachers do not have the skills to assist or instruct their students in the use of the Internet to conduct research. In many cases teachers are unable to perform even routine tasks using state of the art technology. Therefore, teachers are using technology superficially or not at all. A state wide survey of teachers done by the Minnesota Department of Education found that few teachers had acquired anything more than the most rudimentary computer skills. It was also noted that the vast majority of teachers still regard technology as alien to their teaching styles (West, 1990). Furthermore, teachers use computers far less on a daily basis than workers in other professions (Cuban, 1994).

Teachers who do not use computers in many cases express fear of change, fear of technology, fear of the teacher's role being displaced by technology, and a distrust of non-educators. Many teachers express concerns that the technological revolution is being

driven by entrepreneurs and businesses whose motives may be suspect. According to Woodward and Gersten (1992), computers have commonly been deployed in classrooms and labs in a way that does not mesh well with the various demands and routines of a teacher's day. Callister and Dunne (1992) support Woodward and Gersten's position when they note that technology enthusiasts often forget machines are tools which are valuable only when a human being organizes their use in a productive way, and that the computer industry has failed to win educators over. Callister and Dunne (1992) found many teachers feel computers shift the locus of instructional control from the teacher to a distant programmer, remove the teacher from the instructional loop, and shift the definition of "important knowledge" by reinforcing myths about the supremacy of technology (p. 327).

Technology use by teachers is affected by "access, integration, training, support, obsolescence, and cost" (Greenwood & Rieth, 1994, p. 106). Interactive technologies create new roles for teachers and place increased demands on teacher time. Teachers are not being provided with sufficient training to successfully implement the new interactive methods of teaching and learning. Prior to the mid 1980s when technology became more affordable, and hence, more widely available, most teachers did not have opportunities to learn to use computers. Even recent graduates of teacher certification programs were not taught how to effectively use technology (West, 1990). Without sufficient training and experience, teachers are faced with a mandate to make instructional use of technology. In many cases, they lack an understanding of (a) why technology aids instruction, (b) how to use technology in an academically sound way, and (c) the anticipated outcomes of integrating technology into the classroom. Teachers who have not received on-line training and do not have convenient access to technology are unable to use computers in the same way other computer literate adults do: to enhance performance in directly gathering, organizing, and presenting information. Teachers who do not have on-line

expertise are unable to incorporate the associated skills and experiences into their teaching and therefore can not endow their students with these technological skills (Role of, 1996). Teachers are not being instructed in using the Internet to conduct research; nor, are they being provided with opportunities to become proficient in the use of technology. In essence, teachers do not know how to use the Internet to do on-line research and are therefore, unable to assist or instruct their students in its use.

In summary, students do not have the skills needed to develop strategic questioning, planning, searching, and analysis tactics which would enable them to effectively use the Internet to conduct research. They are not taught to question and plan prior to conducting their search. Other essential skills are also missing; they do not know how to use keywords and Boolean logic while performing a search. Subsequent to searching, they are not able to determine the validity and reliability of the materials they have obtained. Establishing the credibility of a resource or even determining who or what organization is responsible for a web page may not be easy. Students are not questioning the validity of a resource whose origins are not easily discernible. Teachers are not being provided with opportunities to acquire the requisite skills and to build confidence in their own ability to perform the tasks; consequently, they are unable to facilitate student growth in using the Internet for research purposes. For both teachers and students, exploring the Internet can be difficult and frustrating. In the words of Lisa Janicke-Hinchliffe (1997), "Many people take a 'when I need it, then I learn it' approach to developing Internet skills and learning about electronic resources. This approach is very effective since the learner immediately applies the newly gained knowledge in a specific context, thereby practicing and internalizing it; however, it is also very time-consuming and often frustrating" (p. 1).

Chapter III: Anticipated Outcomes and Evaluation Instruments

Goals and Expectations

This writer's goal was that students would be able to use the Internet effectively to do research.

Expected Outcomes

The following outcomes were projected for this practicum:

1. Students will have increased their knowledge of the use of the Internet to carry out research
2. Teachers will be more competent in their use of the Internet and will therefore be better able to teach their students to appropriately use the resources.
3. Librarians, teachers, and students will have a relevant unit of study available for their use.

It was anticipated that 75 of this writer's students would improve in their ability to use the Internet to conduct research. This was to be measured by using a 17 question pre/post-test which covered subject directories, search engines, and search strategies. The average score on the post-test of student knowledge was projected to increase ten points over the average score on the pretest. This increase would represent the change in the level of performance which would constitute success in improving student ability to use the Internet to do research. The improvement that occurred was to be measured by administering a post-test. Student performance on the post-test would be compared to performance on the pretest.

It was expected at least 10 teachers, out of 12 to 14 predicted participants of the district's 117 teachers, would learn to use the Internet to do research. In turn, it was anticipated they would endow their students with the requisite skills. Furthermore, it was

predicted that at least 10 of the teachers would have intentions of using the Internet to conduct research in their classes. Success of the outcome would be determined by using an evaluation form (see Appendix E).

The final expected outcome was a unit of study for teachers and librarians to use with students (see Appendix F). The appropriateness and relevance of the unit was to be assessed by (a) having the unit reviewed by a teacher, a librarian, and the technology coordinator prior to use so that appropriate revisions could be made; and (b) asking the teachers and other staff members to critique the unit. This was to be accomplished using an instructional unit evaluation form (see Appendix G) which would ask educators to rate the relevance of the materials to student needs, as well as the appropriateness of the level of difficulty, and to provide suggestions for improving the unit. The unit would be considered successful if 7 or more of the projected 12 to 14 educators indicated the material included was relevant, and the level of difficulty was appropriate.

Measurement of Outcomes

As evidenced by the results of the post-test, students were to increase their knowledge of how to use the Internet to conduct research. Standard deviation, mean, median, and mode were to be calculated for both the pretest and the post-test to determine the central tendency (distribution) of scores. A correlation co-efficient was to be calculated to determine the extent of the relationship between performance on the pretest and performance on the post-test.

Teacher competence would be measured by using the evaluation form which asked them to evaluate the following: (a) relevance of the information and materials to be provided, (b) level of difficulty, (c) intention to use the information and/or materials with their own students, and (d) interest in attending workshops on the topic (see Appendix E). The form employed a Likert scale with ratings ranging from 5, for strongly agree, down to

1, for strongly disagree. Teachers were to use it to rate the relevance of the information and materials for their students' needs. In rating the level of difficulty, the choices ranged from 5, for too difficult, to 1, for too easy; 3 indicated the level was just right.

The final expected outcome, a unit of study, which could be used in part or as a whole, would be made available for use by students, teachers, and librarians. The appropriateness and relevance of the unit would be assessed by (a) having the unit reviewed by a teacher, a librarian, and the technology coordinator prior to use in the workshop so that appropriate revisions could be made before use; and (b) asking the teachers and other staff members who participated in the workshop to critique the unit. This was to be accomplished using the instructional unit evaluation form (see Appendix G) which asked participants to rate the relevance of the materials to student needs, the appropriateness of the level of difficulty; and to provide suggestions for improving the unit. The form employed a Likert scale with ratings which ranged from 5, for strongly agree, down to 1, for strongly disagree, to rate the relevance of the information and materials to student needs. In rating the level of difficulty, the choices ranged from 5, for too difficult, to 1, for too easy, with 3 indicating the level was just right. Space was provided for a free response so that suggestions for improvement could be made. A tally was to be made of participants responses. The unit would be considered successful if 7 or more of the projected 12 to 14 teachers participating in the workshop indicated the material included was relevant and the level of difficulty was appropriate.

In conclusion, throughout the implementation phase a journal was to be kept. Entries were to be recorded systematically and chronologically. The purpose of the journal would be to see if unanticipated patterns could be discerned, to note any interesting occurrences, and to facilitate recognition of relationships among events which occurred.

Chapter IV: Solution Strategy

Discussion and Evaluation of Solutions

The problem to be solved in this practicum was that students were not able to use the Internet effectively to do research. Students were not using appropriate strategies when employing the Internet to conduct research. They were not doing the pertinent planning prior to performing research; nor were they taking the time during and after their search to evaluate the validity of sources and materials accessed through the Internet.

The literature review provided insights regarding the problem. It is imperative to teach students the strategic questioning, planning, searching, and information analysis skills needed to use the Internet effectively (McKenzie, 1995). Students must acquire an understanding that gathering data on the Internet is only a small portion of the task. Questioning and planning prior to gathering information are obligatory steps for students to take. They must be taught to think about their topic prior to searching. It is exigent for students to learn that determining search terms and search tools before actually doing the research will result in more efficient, more productive searches (Barker, 1997). Indispensable strategies for students to exercise are to: (a) keep a list of terms or search phrases that work, (b) determine the best search engine based on their needs, (c) choose specialized resources to add depth and variety to their research; as well as, (d) take notes in useful ways such as using visual organizers, keeping lists, creating an outline, putting notes on index cards, and highlighting hardcopy (Abilock, 1966). Subsequent to gathering information, it is essential for students to know procedures for sorting and sifting, synthesizing, and evaluating the resources and materials they have acquired (McKenzie, 1995).

Learning to browse in a linear manner is sine qua non (Wepner, Seminoff, & Blanchard, 1995). Students should develop an understanding that although nonlinear

browsing is sometimes interesting or entertaining; it is not an efficient way to use the Internet for research purposes (Barker, 1997). It is important for students to realize that without appropriate search strategies, they may find surfing the Net to be addictive, time-consuming, and unproductive. Requiring students to search by keyword rather than by subject will increase the amount of relevant information they obtain. Students require assistance to overcome difficulties choosing search words or concepts. Without such guidance, students frequently use words that are too general and result in too many hits. They are equally likely to choose words that are too specific and result in few or no hits. According to Tenopir (1997), "Retrieving too many hits may not concern users; they will read through 300 hits instead of figuring out what they really want" (p. 32). She goes on to say, "When they get no hits or very few hits, they just walk away assuming the database does not have the information they need rather than asking for help or trying a different search strategy" (p. 32). Teaching the skills which will enable students to sort through the profusion of information available on the Internet is obligatory. Without such skills, they may be overwhelmed by the excessive amount of data available or discouraged by their inability to retrieve any data.

Students must be taught the benefits of using Boolean logic to perform more precise searches. Such logic is counterintuitive to those who do not have an understanding of it. A deficiency in basic knowledge of how to use or and and in a search causes inappropriate search results (Tenopir, 1997). It is desirable for students to be able to (a) use the Boolean and to narrow the search to include more than one key word; (b) use the Boolean or to broaden a search to include any of the keywords; (c) use the Boolean not to narrow a search by excluding a specific meaning of a word; (d) use nesting to combine Boolean words with parentheses to perform multiple tasks at once; (e) use truncation to search using the root of a word, thereby including different word endings; (f) use controls by adding plus or minus signs to indicate key terms which must or must not be included in

a search; (g) use quotation marks to search for a phrase; and, (h) recognize case sensitivity is not built into most search engines (Abilock, 1996). Many common errors can be avoided by providing students with a command of Boolean operators. Students must also learn that searching by keyword rather than by subject will increase the amount of relevant information obtained; and using keywords alone will not produce the correct level of specificity. In addition, learning how to use wildcard characters to perform an all inclusive search should also be expected of students (Short & Sproesser, 1993).

The literature also suggests another resource is helpful. A complete directory of resources which are available on the Internet does not exist; consequently, it can be difficult to find information. Although a complete directory is not available, it is advantageous for students to use a hardcopy guide to sites on the Internet to direct them in their choice of sites (Janicke-Hinchliffe, 1997).

Students benefit from repeated exposure to the strategies and techniques which facilitate effective searches using the Internet. A lack of recurring opportunities for students to practice those strategies and techniques must be addressed. One class session of 45 minute duration without systematic follow-up is not effective. Learning opportunities must be created for students to become proficient users of Internet Resources. In order for students to understand content, search strategies, and search engines, far more than a brief introduction to and interaction with the resources available is required (Tenopir, 1997).

Students must be taught the skills necessary to determine the validity of materials obtained using the Internet. Just as educators teach students to evaluate what is happening in their daily lives, educators must teach students to be cautious and to become independent decision makers in their use of the Internet. It is important for students to learn that information on the Internet is not subject to the same screening and scrutiny to which information contained in encyclopedias or standard reference books is subjected.

Although the Internet has a lot to offer, students must realize they cannot assume its resources are valid or reliable. Students must be taught that using state of the art technology is not equal to obtaining valid, reliable data. Also, student confusion based on the lack of physical separation of sources on the Web must be addressed. Because students can move from one resource to another simply by clicking on the mouse button, they may find it difficult to differentiate between valid and invalid sources.

Students have to have guidelines for using the Internet which take into consideration their developmental stage, aptitude, and prior experience. Students must be provided with guidelines to use in evaluating data. It is helpful for students to have a checklist of essential Internet document elements (Scholz, 1996). A checklist facilitates a systematic approach to evaluating information obtained on the Internet to determine how accurate and how usable the data is (Richmond, 1997; Tillman, 1997). At the bare minimum these guidelines should address accuracy, timeliness, the authority of the author, and any bias on the part of the author. Any evaluation form which is developed for use by students should incorporate: (a) a basis for including the information; (b) the author's credentials; (c) the author's affiliation or sponsor; (d) a comparison to related sources; (e) the currency of the information; and (f) an assessment of the quality of the information. In short, students must be taught how to evaluate sources to determine what is worthwhile and what is not (McKenzie, 1995; Micke, 1996). Developing suitable student judgment of resources will require providing students with appropriate materials, training, and experience (Micke, 1996).

In reviewing the literature, it became apparent students will not be taught to use state of the art technology effectively unless the educators who teach them are first empowered to use it themselves. Most teachers do not have the skills to assist or instruct their students in the use of the Internet to conduct research. In many instances, there is an urgent need to teach teachers how to perform even routine tasks using state of the art

technology. Too many teachers are using technology superficially or not at all. In many cases, teachers are using technology primarily for enrichment or for occasional individual remediation rather than as a major tool to assist students in learning to think, to accomplish learning tasks, and to develop understanding (Becker, 1991). It may be necessary to compel teachers to recognize, "In our quest for information -- facts, statistics, summaries, and bibliographic data -- computerized sources have become indispensable" (Watts, 1997, p. 59). Through the use of computers, resources are available on one's desktop seemingly instantly and at any time of day. Computerized sources of information truly have become essential (Watts, 1997). In Watt's (1997) words, "It's the job of the [teacher] to teach students to analyze, evaluate, and select material" (p. 58). Learning to utilize the technology that is available to them within their work setting is imperative for teachers. In many schools, expensive equipment is sitting idle (Saks, 1993).

Interactive technologies create new roles for teachers and place increased demands on teacher time. Because of this, faculty training in the use of new interactive technologies for teaching and learning is necessary. It is imperative for teachers to understand why technology aids instruction, how to use technology in an academically sound way, and what the anticipated outcomes of integrating technology into the classroom are. Teachers need to overcome their anxiety regarding integrating computers into their classrooms (Galliher, 1995; Kearsley, 1995; Shick, 1996). In many cases, they have to overcome fears based on their belief that their students know more about technology than they do ("First Things First", 1991). Training should be directed toward decreasing computer anxiety and increasing the use of technology by teachers (Shick, 1996).

With the exception of education, social institutions have moved away from being organized around print technology. In the manner of other professionals, teachers must learn to deploy technology as an assistive device to make the pedagogical portions of their jobs easier (Woodward & Gersten, 1992). In their classrooms, it is important for them to

adopt technology in a manner which is congruent with their teaching styles (West, 1990). It is necessary to instruct teachers in using the Internet to conduct research and to provide them with opportunities to build confidence as they become proficient in the use of technology. There is an urgent need to instruct teachers in how to do on-line research so they will, in turn, be able to assist or instruct their students.

Accordingly, in this writer's sphere of influence, several possible solutions existed. The Utopian solution would have been to be able to train all current and future teachers who would have in turn passed their expertise on to their students.

However, the development of a unit of instruction which could be used with this writer's students was a possibility. The potential existed to share the unit with other teachers in the school district. It was also feasible to place it on file with EIRC (Education and Information Resource Center, a state funded facility in Sewell, NJ). Also achievable, was for this writer to offer a workshop to teachers within the district either during an in-service day or as an after school mini-workshop. It was conceivable to do this alone or in conjunction with other staff members. The district's Technology Coordinator expressed interest in having an after school mini-workshop.

Description of Selected Solutions

This writer developed an instructional unit on doing research using the Internet. This writer's students were pretested. Subsequently, the unit was taught. It was expected that upon completion of the unit, students would have improved their ability to: (a) use Boolean logic, (b) browse in a linear way, (c) search by keyword as well as by subject, (d) use wildcard characters to perform all inclusive searches, (e) use a search form to guide them, (f) use hardcopy guides to Internet sites, (g) apply the information processing cycle to data acquired on the Internet, and (h) evaluate the validity and reliability of the information obtained (Davis, 1995; McKenzie, 1995; Minnich & McCarthy, 1986;

Richmond, 1997; Short & Sproesser, 1993; Tillman, 1997; Wepner, Seminoff, & Blanchard, 1995).

The district's Technology Coordinator expressed interest in a district wide workshop for teachers and other interested staff members. It was anticipated that the workshop would be held after school and attendance would be voluntary. At that point in time, the instructional unit and insights gained from the process of preparing and implementing the unit were expected to be shared. It was anticipated that the workshop would be conducted cooperatively with an English teacher and a librarian. Efficacy of the workshop was to be determined by using a brief survey which teachers were to complete at the end of the session. This workshop was expected to fulfill the need to bring about change through increased teacher education (Papert, 1993). It was expected be one more step which would enable teachers to use computers in the manner employed by other professionals. It was also intended to decrease their anxiety and potentially increase their use of technology (Shick, 1996). It was hoped they would be able to incorporate the experience into their teaching and endow their students with similar skills (Role of, 1966). McKenzie (1995) summed it up when he wrote: " In many respects, our students and our models for school research are ill-prepared to produce quality research with the . . Internet." (p. 8).

Report of Action Taken

The first week of month one was used to (a) develop a rough draft of an instructional unit, (b) develop a rough draft of a search form, (c) develop a rough draft of the survey form to be used with teachers upon completion of the workshop, and (d) develop a rough draft of the resource evaluation form. The second week of month one was used to consult with the librarian regarding the On-line Search Form, the Internet Information Evaluation Form, and the instructional unit. The technology coordinator was

also consulted during that week regarding any suggestions she might have had for improving the previously mentioned forms, the teacher survey form, and the instructional unit. During week three of month one, necessary revisions were made to the various forms and to the instructional unit. Week four of month one was used to (a) finalize the instructional unit, (b) finalize the search form, (c) finalize the teacher survey form, and (c) finalize the resource evaluation form.

The computer lab was reserved for use with classes and the instructional unit was submitted for photocopying during week one of month two. This was where the first obstacle was encountered. Server problems and scheduling difficulties made it impossible to schedule the computer lab for a solid week. It became necessary to schedule the days spread out over three weeks. During week two of month two, the technology coordinator was contacted to set a date for the teacher/staff workshop. At this point another obstacle had to be overcome.

It was initially anticipated the instructional unit would be used with this writer's students prior to presenting the teacher workshop. That sequence would have allowed for modifications, based on usage, to be made to the instructional unit prior to the teacher workshop. The technology coordinator recommended scheduling the teacher workshop after mid-term examinations which was also before this writer would have used the unit with students. She pointed out that after mid-term examinations is a time of the year when the demands on teacher time ebbed. She indicated this would make it easier for most teachers and staff members to attend. She also pointed out the benefits of delaying until after this writer had taught, and possibly modified the unit based on experience, were far out weighed by the advantages of timing the workshop for when the greatest number of interested teachers could attend. It was jointly decided to conduct the teacher workshop the week after mid-term examinations to maximize attendance.

During this same week, the English teacher and librarian who had expressed an

interest in doing a collaborative workshop for educators were contacted to finalize plans. This was also the week during which this writer was supposed to implement the instructional unit by teaching students : (a) to browse in a linear manner (Wepner, Seminoff, & Blanchard, 1995); (b) to use Boolean logic to focus their search (Short & Sproesser, 1993; McKenzie, 1995); (c) to search by keyword rather than by subject to increase the amount of information obtained; (d) to use wildcard characters to perform an all inclusive search (Short & Sproesser, 1993); (e) to use a search form to guide them (Minnich & McCarthy, 1986); (f) to start by using a hardcopy guide to sites on the Internet; (g) to question and plan prior to gathering information, and to sort and sift, synthesize, and evaluate subsequent to conducting a search tasks (McKenzie, 1995); and (h) to use a formal strategy to evaluate the validity and reliability of information obtained from a website. Tasks were to be distributed in the following manner: on Monday, the pretest was be administered and search engines were to be taught; on Tuesday, Boolean logic and wildcards were to be taught; Wednesday was to be used for students to prepare for their search, Thursday and Friday were to be used to provide students with hands on experience doing searches. In actuality, during week two of month two, the pretest was administered, and Boolean logic was taught in the regular classroom. Also, two days were spent in a district computer lab conducting research.

During week three of month two students were to spend a portion of each class period evaluating the validity and reliability of the materials they had obtained, and at the end of the week the post-test was be administered to students. As a result of the previously mentioned constraints, the students prepared for the search using copies of the On-line Search Form, which is included in the instructional unit (see Appendix F) during regular class periods. They also spent two classes in one of the district computer labs doing research. Students were to spend one to two class periods preparing a poster which depicted the results of their search and were then to present the results of their research

using the posters as visual aides during week four of month two. In reality, during week four of month two, the students had a final day in a computer lab to complete their research, they then spent one day taking the post-test and preparing a poster, and one day taking turns doing presentations about the strategy they had employed and the results of their searches.

At the end of the week, this writer was approached by the senior high school librarian concerning doing a second workshop for educators on the same topic. The majority of the teachers who had taken part in the completed workshop were from the intermediate high school. The senior high school librarian felt that a second teacher workshop in the senior high school would make it available to senior high school teachers who found it inconvenient to travel from one building to the other and so did not attend the first workshop. Based on the input from the librarian and the results of the workshop evaluation form, the technology coordinator agreed that a second teacher workshop should take place.

The results of the pre and post-tests were evaluated during week one of month three. Also, progress reports were sent to the Practicum Advisor and the Director of Practicums. During week two of month three, teachers were supposed to be provided with hands on experience using the Internet to do research. As was previously noted, scheduling constraints previously mentioned necessitated moving the workshop to week three of month two. During that week a workshop for educators on doing research on the Internet was conducted. During the workshop, the teachers were given an opportunity to conduct their own search with individual assistance provided on an as needed basis. They were provided with materials for use with their students. They were given a copy of the unit developed for teaching students how to use the Internet productively. Also, the materials included a copy of the pre/post-test, as well information on search engines, databases, and search strategies. Teachers attending the workshop were asked to complete

a brief survey regarding the usefulness of the workshop and the probability they would use any of the materials in their own classes. Subsequently, during week three of month three, the results of the teacher workshop survey were analyzed. During week four of month three a newsletter (see Appendix H) was developed to provide teachers and other staff members who had expressed an interest with a synopsis of the results of the practicum.

The practicum was extended to month four to provide a second workshop for teachers. During week one of month four, this writer, the senior high school librarian, and the technology coordinator set the date for the additional teacher workshop on using the Internet to conduct research. During week two, this writer and the senior high school librarian met to modify and supplement the instructional unit. At that time, a handout which provides URLs for sites containing useful information about conducting research on the Internet was added to the instructional unit (see Appendix I). Materials were submitted to photocopy services for duplication during week three of month four. In week four of month four, the second workshop was presented.

In summary, the solution strategies which had been selected based on a review of the literature were implemented. An instructional unit for use with students, by teachers and librarians, was developed. The instructional unit was used with students in this writer's classes. In addition, two workshops on doing research using the Internet were made available to teachers and other staff members in this writer's workplace.

Chapter V: Results

Results

The problem to be solved in this practicum was that students were unable to use the Internet effectively to conduct research. This writer's goal was to improve student competencies related to conducting research on the Internet. Three outcomes were projected for this practicum:

1. Students will have increased their knowledge of the use of the Internet to carry out research. This outcome was met.

Forty six students were instructed in the use of subject directories, databases, and search strategies. They were provided with an on-line search form to assist them in determining and clarifying their search strategy as well as an Internet Information Evaluation Form (see Appendix F) to aid them in determining if the information they gathered was valid and reliable. Because 15 of the students were involved with special education, the results were analyzed for the group as a whole, as well as separately for the subsets of special education and regular education students. The criteria for success was a 10 point rise in the average student score. Analysis of the tests established there was a 41 point rise for the group as a whole, with special education students attaining an average 37 point increase and regular education students achieving a 44 point improvement in average score.

2. Teachers will be more competent in their use of the Internet and will therefore be better able to teach their students to appropriately use the resources. This outcome was met.

It was projected that a minimum of 10 teachers, 8% of the district's 117 teachers, would have learned to use the Internet to do research. Originally, one workshop, to be held in the district's intermediate high school was planned. It was anticipated that between 12 and 14 teachers would attend the after school workshop. It was further anticipated at

least 10 of those in attendance would leave with the intention of using the skills and

Table of Results	Special Ed	Regular Ed	Total
Mean - Pretest	24	50	41
Mean - Post-test	61	94	82
Improvement - Mean	37	44	41
Median - Pretest	21	53	41
Median - Post-test	65	86	65
Mode - Pretest	12 and 18	53	35
Mode - Post-test	65	100	100
Standard Deviation - Pretest	13	18	20
Standard Deviation - Post-test	13	8	19
Correlation Coefficient	0.51	0.35	0.68
n =	15	26	41

Table 2: Comparison of Student Scores from Pretest to Post-test

materials acquired with their students. Subsequent to the success of the first workshop, it was determined a second workshop would be advantageous. A large number of attendees at the first workshop were interested in a chance to reinforce the skills learned in the first session. Also, there were teachers and staff members who were interested but unable to attend the first session because of the time and location. Therefore, a second workshop was scheduled and held in the district's senior high school. There were 27 participants at the first workshop as evidenced by the sign-in sheet where people placed their signature as they entered the workshop. The second workshop was attended by 4 teachers and staff members for a total of 31 participants. Teachers and other staff members were given an evaluation form (see Appendix E) which asked them to assess the following: (a) relevance of the information and materials provided, (b) level of difficulty, and (c) intention to use the information and/or materials with their students. Teachers at the first workshop were asked to indicate their level of interest in attending another workshop on the topic. Twenty two of

those attending the first workshop and all four of those who came to the second completed the form. Participants were asked if the information and materials were relevant to them. As depicted in Figure 2, most participants strongly agreed the information and materials were germane to them.

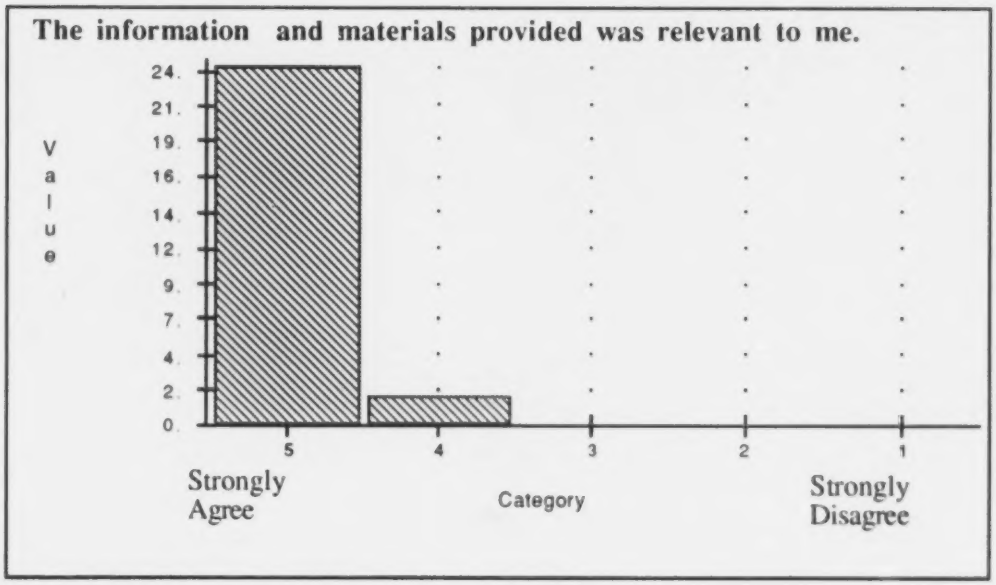


Figure 2: Relevance of Information and Materials

Participants were also asked to rate the workshop's level of difficulty. Choice of responses ranged from 3 for just right up to 5 for too difficult, and down to 1 for too easy. Figure 3 illustrates their responses. Twenty of the 26 respondents rated the level of difficulty as just right. Two rated the level of difficulty at 4, and 2 rated the level of difficulty at 5 indicating they experienced some level of difficulty. A rating of 2 was given by 2 respondents and none of those completing the evaluation form chose a 1.

The third question on the evaluation asked if the participants intended to use what they learned in the workshop with their students. The responses available were: yes, no, or not applicable. Twenty five of those responding indicated yes, while one respondent said no. The final question, asked only of participants in the first workshop, was "Are you

interested in another workshop?" Sixteen answered yes and six said no.

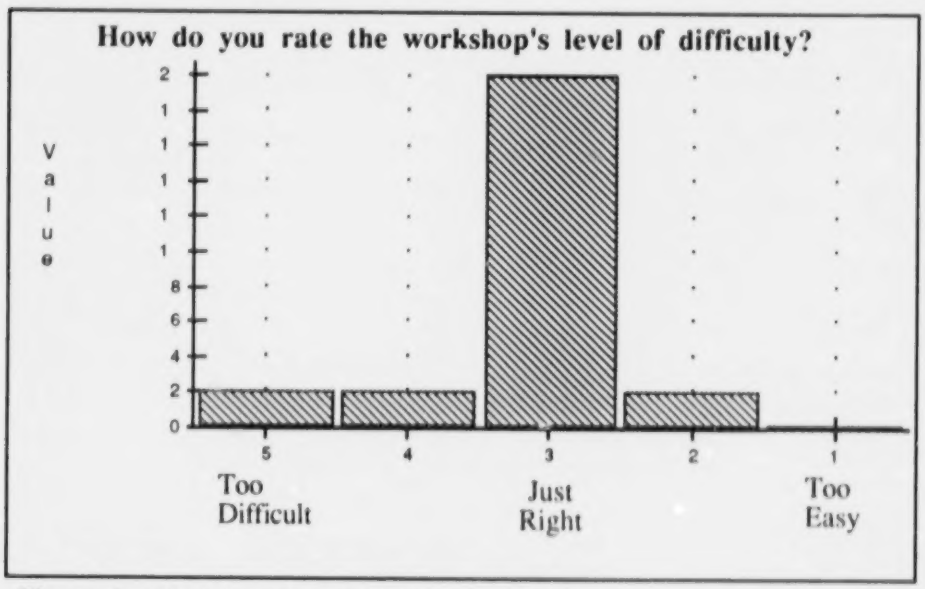


Figure 3: Workshop Level of Difficulty Ratings

3. Librarians, teachers, and students will have a relevant unit of study available to them. This outcome was met.

The instructional unit was to be considered successful if seven or more of an anticipated ten teachers indicated the material was relevant and the level of difficulty was appropriate. Twenty of those attending the workshops found the material was pertinent and the level of difficulty suitable. A further criteria was at least ten teachers indicating they intended to use all or part of the unit with their students. Twenty five of the twenty six workshop participants who completed the evaluation form said they planned to use materials from the unit with their students. In addition to workshop participants, one of the district's librarians, an English teacher, and the technology coordinator reviewed the unit. The three of them completed the Internet Research Instructional Unit Evaluation Form (see Appendix G). The final version of the unit was predicated on this writer's original work and modified based on the input from the librarian, English teacher, and Technology Coordinator. All three deemed the final version of the unit relevant and of a proper level of

difficulty.

Discussion

As was noted in Chapter 1, this writer teaches a variety of courses for any of four departments: the Mathematics, Computer Science, Special Education, and Business Departments. When this practicum was conceived, this writer had approximately 75 students, all of whom were in regular education classes. At that point in time, the projections were for this writer to be teaching similar courses in the subsequent school year when the practicum would be implemented. In actuality, when the practicum was implemented, this writer had 26 honors level students in two programming classes, 16 special education students in a computer applications class developed specifically for special needs pupils, and 16 students in two sections of resource center support. In resource center support, students are provided with additional time to take tests, and assistance with their homework and any incomplete classwork. Because resource center support is designed to supplement the instruction special needs students receive in their other courses, it would have been inappropriate to include them in this problem solving endeavor. Therefore, the first part of this practicum was focused on improving the skills of the 16 special education and 26 regular education students. One of these students was subsequently placed on homebound instruction and was not included in the analysis of results. Although unanticipated, it was beneficial to be able to analyze results based on student classification. The findings will now be shared with members of the special education department as well as regular education teachers. The results provide teachers with valuable information relating to how the performance of special education students compares to that of regular education students when involved in a practical, real life type of activity.

The mean, median, mode, and standard deviation were calculated to determine the

central tendency of the scores; i.e., to summarize the data so that a single numerical value could be used to represent the sets of results. The results were asymmetrical in that the mean, median, and mode were at different points in the distribution on the pre-test as well as the post-test for both regular and special education students (Gall, Borg, & Gall, 1996). Basing comparisons on the means, special education and regular education students improved in their scores 37 and 44 points respectively with an associated 41 point rise for the total group. This greatly exceeded the ten point rise in average score which was to be the criteria for success.

The standard deviation and range for the total group and for each subset was computed as indicators of variability. Variability represents how widely scattered the scores are in relation to the mean. The standard deviations on the pre-test were 13, 18, and 20 for special education students, regular education students, and the total group respectively. On the post-test, it was 13 for special education students, 8 for regular education students, and 19 for the group as a whole. The larger the standard deviation is, the greater the distribution of scores from their mean. The variability of scores was greatest for the group as a whole and least for the special education students. This finding is supported by the range of scores illustrated in Table 3.

	Range	
	Pre-Test	**Post-Test**
Regular Education		
Highest	82	100
Lowest	6	71
Range	76	29
Special Education		
Highest	57	82
Lowest	12	41
Range	45	41
Total Group		
Highest	82	100
Lowest	6	41
Range	76	59

Table 3: Range of Scores

The range on the pre-test is lowest for the special education students and the same for regular education students and the group as a whole. On the post-test, the range is greatest for the total group and lowest for the regular education students.

The final computation was that of the correlation coefficient to determine the extent of the relationship between students' scores on the pre and post-tests. Correlation coefficients are between -1 and +1. A correlation coefficient of -1 would indicate a completely inverse relationship between the two scores. In that case, the students who scored highest on one would have scored lowest on the other. A +1 would indicate a perfect positive relationship between the two. For example, the highest scorers on one test would also be the highest scorers on the other test. A score of 0 would show there was no relationship between the scores on the two tests. A score of .85, which would indicate a strong relationship, was predicted for this practicum. The actual correlation coefficients were .51 for special education students, .35 for regular education students, and .68 for the group as a whole. The lower correlation coefficients indicate a student's score on the pre-test will have limited value as a predictor of their score on the post-test. However, these correlation coefficients do indicate a positive relationship between the two tests. They also provide affirmation that student scores will improve with the intervention of teaching strategies and practical experience.

It is noteworthy that the special education students included in the project made significant gains. Although their pre and post-test median scores were significantly lower than those of the regular education students, 24 vs. 50 and 61 vs. 94, the special education students experienced gains in mean score comparable to the gains made by regular education students. The mean score rose 37 points for special education students while the scores for regular education students rose 44 points. When the improvement in median

scores is compared, the special education students experienced the greater gain. The median score rose 43 points for the special education students in contrast with a 33 point rise attained by regular education students. This is also true of the mode. Using (12 + 18)/2 as the pre-test mode for special education students, the mode for special education students increased by 50 points which is analogous to the 47 point increase experienced by the regular education students (see Table 2).

All of the special education students involved in this practicum were classified learning disabled; i.e., there is a significant discrepancy between their level of ability and their academic performance. Because their class has both a teacher (this writer) and a teacher's aide, they received more assistance than the regular education students throughout the project. Nevertheless, for the purposes of this practicum, the unit was taught in the same manner and in the same amount of time to both groups. Based on this writer's experiences teaching both populations, it is probable that the special education students would have attained the same level of expertise as the regular education students had they received more time to work on the unit, along with more reinforcing activities, and possibly some re-teaching.

The workshop was offered to furnish teachers with an opportunity to learn about doing research on the Internet and to give them a chance to "net surf" with assistance provided per need. The workshop was a vehicle for enhancing teacher competency in the use of the Internet so they would be better able to teach their students to do research using the Internet and assist their students in its use. After school workshops for teachers and staff members are held intermittently throughout the school year in this writer's work setting. They are presented by teachers or administrators and are mostly related to software. For example, teachers have created workshops on topics such as how to use the computerized grading software for which the school district has a site license. A typical session was conducted recently by a science teacher who demonstrated the use of the

presentation package incorporated into Microsoft Works 4.0. According to the technology and staff development coordinators who were interviewed, attendance at these workshops is generally 12 to 14 participants. In those interviews, they also indicated attendance has, on some occasions, reached 20. The turnout at the first workshop was unprecedented. There were 27 participants in the first workshop on conducting research using the Internet, a turnout which represents 23% of the total teaching staff. The total attendance at both workshops was 31, or 26% of the teaching staff. This greatly exceeded the criteria for meeting the outcome of training 8% of the current teaching staff. Of those in attendance, 26 completed the evaluation form (see Appendix E) for the workshop.

The final expected outcome was a unit of study which students, teachers, and librarians could use in part or as a whole. The completed unit includes a sample unit lesson plan, a classroom activity, a copy of the pre/post-test, and a list of sample research topics organized by subject area. Also included is information regarding search engines, databases, subject directories, essential search strategies, an on-line search form for organizing one's search, and an Internet evaluation form for assessing the validity of sources. The original unit was developed by this writer. The final version of the unit was modified to include suggestions made by the technology coordinator, the English teacher, and the librarian. The final version also incorporates a suggestion made by a student. He indicated it would have been helpful for the Internet evaluation form to include a place where the URL (Uniform Resource Locator), or Internet address, of the source could be jotted down. Twenty six teachers completed the evaluation form which asked them to assess the unit. All twenty six agreed or strongly agreed the materials were at a suitable level of difficulty. Furthermore, 25 of them said they planned to use what they learned and had acquired with their students. In addition to the use of materials by teachers, the librarian in one of the district's schools has made copies of the on-line search form and the Internet evaluation form for use by students in the media center.

There was an unanticipated outcome in addition to the second workshop. The technology coordinator felt the evaluation form for determining the efficacy of the workshop (see Appendix E) elicited more useful information than the one previously in use in the district. Therefore, she requested permission from this writer to use the form developed in conjunction with this practicum for future technology workshops held within the school district.

Recommendations

In the beginning stages of this practicum, teachers in this writer's work setting were asked to complete a preliminary questionnaire (see Appendix A). The questionnaire asked three questions: (a) What is a typical question students might research in your subject area? (b) What would it be helpful for your students to know how to do when doing research in general? and (c) What would it be helpful for your students to know when doing research on the Internet specifically? It would have been helpful to start the questionnaire by asking: "Do you use the Internet to conduct research?" A check off for a dichotomous response, yes or no, could have been included. The teachers would have then been asked to complete the remainder of the form if they answered yes to question one. It is possible this would have enhanced the rate of response from teachers who do not use technology. Specifically, those teachers who do not use the Internet with their students would have had a reason to provide a response and to return the form.

The students involved in the project were required to complete an Internet Evaluation Form for each of four sources acquired during their search. Some of the students expressed concern that if they determined a resource was unreliable, they would have to do more research and complete an additional evaluation form. In this writer's opinion, the point of the unit was to have students learn strategies and techniques to facilitate research, as well as to assist them in learning how to determine if a site was

reliable and valid. It would have been pointless to ask them to do more work if one of the sites they assessed was probably invalid or unreliable. In a related area, students were permitted to choose their own topics. They were also encouraged to do research which they could use for their other courses. This turned out to be a powerful motivator for many of the students. Some students indicated the unit was fun, while others were grateful to be able to use class time to work on assignments for their other courses.

Finally, flexibility is important. When working with technology, things go wrong. Servers go down, the power goes out, systems malfunction, hardware is out of service, software crashes, and even if none of these things occur, someone else may be signed up for the equipment needed. Having a back-up plan for days when the computer system is unavailable is very advantageous.

Dissemination

The outcomes of this practicum will be disseminated in a variety of ways. A newsletter (see Appendix H) which shares the results of using the instructional unit with this writer's students along with the feedback from the teacher workshop was distributed to the teachers and staff in this writer's work setting. A copy of the instructional unit will be placed on file at EIRC (Educational Information and Resource Center) in Sewell, New Jersey. This will make the materials available to teachers throughout the state.

Further dissemination will take place in a totally unanticipated manner. This writer presented a poster based on the practicum at a recent class held by Nova Southeastern University. Other class members were interested in the instructional unit. Copies of it will be made and shared with them as they requested.

References

Abilock, D. (1996). Research on a Complex Topic. NUEVA library help. Available at: http://www.nueva.pvt.k12.ca.us/~debbie/library/research/adviceengine.html.

Baldyga, K. (1997, May). Results of the student technology survey. et.com Newsletter, 1 (4), 1-2.

Barker, J. (1996). Searching the world wide web: Strategies, analyzing your topic, choosing search tools. [On-line], University of California, Berkeley. Available: http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Strategies.html/#AnalyzeTopic

Becker, H. J. (1994, May). When powerful tools meet conventional beliefs and institutional constraints. The Computing Teacher, 18 (8), 5-9.

Callister, T. A., & Dunne, F. (1992, December). The computer as doorstop: technology as disempowerment (with reply by G. Solomon). Phi Delta Kappan, 74, 324-329. Abstract from ERIC: Item: 45RGA.

Cuban, L. (1994, March). Computers meet classroom: Who wins? [Abstract]. The Education Digest, 59, 50-53. Abstract from ERIC: Item: 214RGA.

Davis, C. (1995, October). The I-search paper goes global: Using the Internet as a research tool. English Journal, 84 (6), 27-33.

First things first - smart districts begin with teacher training (1991, January). Teacher Magazine, 2 (4), 36-39.

Galliher, R. (1995). Preparing technical educators for interactive instructional technologies: A review of research and practice. (Report No. CE071196). Denver, CO: American Vocational Association. (ERIC Document Reproduction Service No. ED 392 997).

Grassian, E. (1997). Thinking critically about world wide web resources. [On-line], UCLA College Library. Available: http://www.library.ucla.edu/libraries/college/instruct/critical.htm

Greenwood, C.R., & Rieth, H.J., (1994, October-November). Current dimensions of technology-based assessment in special education. Exceptional Children,61 (2), 105-113

Janicke-Hinchliffe, L. (1997). The electronic library: The world wide web. [On-line], Available: http://alexia.lis.uiuc.edu/~janicke/Electronic.html

Janicke-Hinchliffe, L. (1997). Resource selection and information evaluation. [On-line], Available: http://alexia.lis.uiuc.edu/~janicke/Evaluate.html

Kearsley, G. & Lynch, W. (1995). Educational leadership in the age of technology: The new skills. In G. Kearsley & W. Lynch (Eds.), Educational Technology - Leadership Perspectives. (pp. 181-195). Englewood Cliffs, NJ: Educational Technology Publications.

McKenzie, J. (1995, May/June). Direct connect: Beforenet and afternet. MultiMedia Schools 2 (3), 6-8.

Micke, M. M. (1996, October). The case of hallucinogenic plants and the Internet. Journal of School Health, 66 (8), 277-280.

Minnich, N. P. & McCarthy, C. B. (1996, April). The "clipping thesis": An exercise in developing critical thinking and online database searching skills. School Library Media Activities Monthly, 2 (8), 45-47.

Papert, S. (1993). The children's machine: Rethinking school in the age of the computer. New York, NY: Basic Books.

Pask, J., Kramer, R., & Mandemack, S. (1993). The savvy student's guide to library research. [On-line], Available: http://thorplus.lib.purdue.edu/~techman/eval.html

Richmond, B. (1997). Ten c's for evaluating Internet resources. [On-line], University of Wisconsin-Eau Claire, McIntyre Library. Available: http://www.uwec.edu/Admin/Library/10cs.html

The Role of On-line Communications in Schools: A National Study [Electronic Database]. (1996). Center for Applied Special Technology [Producer and Distributor].

Saks, J. B. (1993, September). Meeting students' special needs. The Electronic School, 16-19.

Schick, R. W. (1996). Implementation of technology in the classroom. (On-line). Ft. Lauderdale, FL: Nova Southeastern University. Abstract from ERIC Database: Clearinghouse Number: IRO17817 (ERIC NO: ED394516).

Scholz, A. (1996). Evaluating world wide web information. [On-line], The Libraries of Purdue University. Available: http://thorplus.lib.prdue.edu/research/classes/gs175/3gsl175/evaluation.html

Short, E. & Sproesser, G. (1993). Online catalog researching: A thematic unit. School Executive, 29 (5), 50.

Tenopir, C. (1997, 05/01/97). Online databases. Library Journal, 122 (8), 31-32.

Tillman, H. N. (1997). Evaluating quality on the net. Babson College. Available: http://www.tiac.net/users/hope/findqual.html

Valenza, J. K. (1997, May 29). Making search time on the Internet pay off. (tech.life@Inquirer section). Philadelphia Inquirer, pp.F1, F5.

Watts, L. (1997, January). Technology and the liberal arts. Education Digest, 62 (5), 56-60.

Wepner, S. B., Seminoff, J. E., & Blanchard, J. (1995, June/July). Navigating learning with electronic encyclopedias. Reading Today. 28.

West, P. (1990, May 9). Teachers' computer skills self-taught, not a result of training, survey finds. Education Week, 7.

Woodward, J., & Gersten, R. (1992, March-April). Innovative technology for secondary students with learning disabilities. Exceptional Children, 58 (5),407-419.

APPENDIX A

TEACHER QUESTIONNAIRE

In conjunction with a course I'm taking, I am preparing a unit for use with students on how to effectively do research using the Internet. When the project is complete (December, 1997), it will be available to you through Kathy McCormick's office. If you can take the time to answer the following questions and return this form to me, it would be most helpful. I have mailboxes in both buildings.

Thanks,
Anne Pierce

In one or two sentences, what is a typical question students might research in your subject area?

What would it be helpful for your students to know how to do when doing research in general?

What would it be helpful for your students to know how to do when doing research on the Internet specifically?

APPENDIX B

SEARCHING EFFECTIVELY ON THE NET - PRE/POST TEST

Name _____ Date _____

Mods _____

Searching Effectively on the Net

Subject Directories

Use the following answers for questions 1 through 5

A. Lycos Sites by Subject
B. Sirs
C. Yahoo
D. CyberDewey
E. Ebsco Host
AB. Magellan

1. Which of the following organizes Internet resources using the Dewey Decimal system?

2. Which is the subject directory which offers access to the one tenth of web sites most linked to by users?

3. Which combines the best of both human and high tech features, is the largest and most popular directory, and can be used as a search engine to find entire resource lists or to focus within a narrow subject field?

4. Which provides access to thousands of sites which are reviewed by teams of editors and writers, evaluates sites by depth, ease of exploration, and "net appeal"?

5. Which two provide access to full text magazine articles? (Darken both letters on your Scantron)

Search Engines

Use the following answers for questions 6 through 10

A. Altavista
B. Excite
C. Hotbot
D. Infoseek
E. Webcrawler

6. Highly rated for finding scientific information

7. Fast, powerful, and offers lots of pull down options for search refinement including the ability to limit by date, programming language, media type, file extensions (Example: .gif), geographic location, and Internet domain (Example: .com, . edu)

8. Uses a unique technology called ICE (Intelligent Concept Extraction); for example, when users search for "dog care" the engine knows that pet grooming is a related term. It is also good for reference areas such as its yellow pages, people finder, maps, shareware, and dictionary

9. Default search engine for millions of AOL (America On-Line) users; it is often busy at peak times, special features include maps and find an address.

10. Contains Smart Info which features e-mail addresses, stock quotes, phone numbers, and company profiles; this engine allows natural language searching.

Search Strategies

Use the following answers for questions 11 through 16

A. AND
B. OR
C. NOT
D. * (asterisk)
E. $ (dollar sign)
AB. . (dot)
AC. " " (quotation marks)

11. Used to capture synonyms or related words

12. Wildcards used to stand for any string of characters, may be useful when you are unsure of spelling (two answers, fill in both circles on the Scantron)

13. Eliminates possibilities

14. Used to request an exact match

15. Limits your search by requiring that both or all words appear

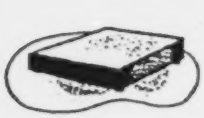
16. Sets words off as phrases to be searched as a whole

17. By default, most search engines:
    A. Are case sensitive
    B. Are case insensitive
    C. Allow the user to determine case sensitivity

APPENDIX C

PHOTOCOPY OF ET.COM NEWSLETTER

et.com Newsletter



TECHNOLOGY COMMITTEE

VOLUME #1 ISSUE #4

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Vice-Principal & Director of Technology

Kathy McCormick
Teacher of Technology

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TV Technician

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Teacher Technicians
1996-97:

Kathy Baldyga

Barbara Beske

Lou Fuller

Jim Garwood

Mike Harrison

Gail Posey

Jim Solly

Results of the Student Technology Survey

by Kathy Baldyga

In order to better meet the needs of our students, the Technology Department put together a comprehensive survey regarding technology proficiencies of the students at Given in English classes, the survey provided valuable information as to the abilities in various computer skills and the extent to which the students use those skills.

Part I of the survey asked the students to identify whether they had a computer at home and how often they used it. A large portion of the students, 92%, report that there is a computer in their home. Fifty-nine percent of the students reported they spent 1-5 hours a week on the computer. Sixty-two percent of them have on-line access but interestingly, 45% said that they spent *less* than one hour a week on-line. Only 19% spent more that 6 hours a week on-line, with the largest percentage of on-line users being with America Online.

Also in Part I, students were asked to rate their keyboarding and word processing skills. Most students believed they fell in the average range of keyboarding (55%) and word processing (57%) skills. Thirty percent of the students surveyed felt they had advanced word processing skills and that they know and use complex formatting techniques.

Part II of the survey asked the students to rate themselves on their ability to perform specific procedures on the computer. They had to indicate whether they were able to perform each task without assistance, with minimal assistance, with moderate to considerable assistance or that they were not familiar with this task.

The students rated themselves from 86% to 94% in their ability to perform and/or explain word processing skills/concepts without assistance. Only 9% of the students felt they were not familiar with these procedures. Students did not rate themselves as high in the area of basic research skills. This included navigating the Internet using a web browser, identifying and using a variety of search engines, understanding menu options of various databases, saving information from databases, and understanding copyright, fair use and acceptable use policies. Whereas the majority of the students rated themselves as being able to perform these skills independently *or* with minimal assistance (69% to 81%), there were higher percentages of students who had difficulty or limited knowledge in these areas (17% to 35%) than any other application category on the survey.

Questioning the students about their familiarity with computer vocabulary (e.g. CPU, RAM, SIMM, SCSI, etc.) indicated that 51% of students required moderate to considerable assistance, *or* were not familiar with the terminology. Only 16% identified themselves as being able to perform or explain these terms without assistance.

Overall, the students at have indicated they have relative strengths in technology. Most of our students have had hands-on experiences with computers and have had success in many basic word processing skill areas. Additionally, the survey data indicated that the ability to use the Internet for research (although somewhat lower than reported ability in other skill areas) is developing.

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The Technology Department plans to use this information to pinpoint areas that need to be addressed within the curriculum, whether for remediation or for enrichment. Classroom teachers play an integral part in this as they include more technology-assisted activities and computer lab usage into their regular classroom activities. The Educational Technology Committee (et.com) is ready and willing to help you incorporate available technology into your classroom. Watch for upcoming workshops or speak to any et.com member for information.

Newspapers on the Net

by Jim Solly

Are you a newsaholic? Do you enjoy knowing what's happening around your state, country, and world? Now there is no excuse for not knowing what's going on around you. If you possess the time and technology, you don't need to leave your front door to catch up on all the news.

Just log onto the Internet, select your favorite search engine, and start looking. If you want to know how the local press is reporting their World Series (or World Cup) victory, or how the British press is dealing with the latest royal "family circus," access is only a few keystrokes away. For you foreign-language types, the possibilities are endless. Here are some of the papers you can access on-line:

The Philadelphia Inquirer
The New York Times
The Boston Globe
The Chicago Tribune
The LA Times
The Washington Post
USA Today
El ABC (Spain)
The London Telegraph
The Jerusalem Post
The International Herald Tribune
Le Monde (France)
The Star & SA Times International (South Africa)
The Asia Times (Hong Kong)
La Reforma (Mexico)

This list represents a very small number of newspapers available. So, happy reading everyone!

Internet-Technology Terms

by Gail Posey

Hopefully you've improved your knowledge of Internet terms during the past year. Here's a few more of those Internet-Technology terms which should help to clarify the Internet world.

BBS (Bulletin Board System)

A system by which a group of users with common interests (like a business, club, or professional society) can share information by "posting" it to an electronic bulletin board.

Bit (binary digit)

A variable or data unit that can take on either of two distinct possible values, such as on or off, yes and no, or 0 and 1.

Byte

A unit of data equal to 8 bits, and hence capable of storing any one of $2^8 = 256$ distinct values. The yardstick by which file size is measured.

Client

When you access a service provided by another computer, the other computer is referred to as the server and yours as the client. When you use a network-oriented program like ftp or telnet, it is running on both machines, but in "server mode" on one end and "client" mode on the other. (e.g file servers, mail servers, and print servers)

Compression

Large files often contain enough redundancy that clever algorithms (such as the UNIX utility compress) can encode the same data in a form that uses up less memory and can be transmitted more quickly.

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GIF (Graphics Interchange Format)
A standard color image format commonly encountered on the Internet. Other common formats are TIFF, PICT, and JPEG.

JPEG (Joint Photographics Expert Group)
A standard (compressed) format for color images, common on the Internet. (.jpg or .jpeg) JPEGs tend to be smaller files than GIFs.

Modem
A device that transmits/receives computer data through a communications channel such as radio or telephone lines. (From mo[dulator]-dem[odulator].)

ROM (Read Only Memory)
This term refers to "permanent" data that is stored in such a way that it can be read (or accessed) but not overwritten. Examples include certain chips in a computer (e.g. BIOS chips) and CD-ROMs.

URL (Universal Resource Locator)
The mechanism used by the WWW system to find a particular page, image, or sound. Basically, an address for the page. For example, the URL for NASA's home page is http://www.nasa.gov.

Computer Whiz Intern

by Barb Beske

Have problems with your computer or software here at school? You may have been rescued by our computer whiz intern, Shane Whilden. Shane is a student at College and is fulfilling his senior field experience requirement by interning here at Schools. I had the opportunity to sit down with Shane recently and ask him a few questions. This is not an easy task when you take into consideration all that is on his plate right now. Shane is a full time student at (5 classes) and is working here as an intern 3 days a week. While Shane is here, he works on day-to-day repairs, maintains and modifies the network, researches software and hardware, and studies the software so he knows it well (and can troubleshoot for all of us when we have problems). He has created a reference manual that outlines his day-to-day responsibilities - both for the purpose of his course requirements and for anyone who might need to take his place. He explained that those in the computer business spend a lot of time having to keep up with the daily changes in the field. Researching the Internet and deciding what is and is not important is almost a part-time job in itself.

Shane will graduate in December with a degree in Computer Science and hopes to find a job that will integrate his two main interests: computer science and the fine arts. Jobs that involve web page design and multimedia development would be right up his alley. Speaking of web pages, Shane is part of the team that develops 's web page. He invites anyone interested in putting class or club information on our home page to contact him. A few departments are represented thusfar.

When asked what he likes best about he noted the focus on technology, the resources available, our friendly staff, our intensive TV Station and the overall atmosphere of our school. He hopes to see departments working closer together when it comes to technology. Shane will still be around this summer working on big projects such as on-line testing and developing a localized intranet. is fortunate to have been chosen as the place of Shane's senior project and we hope he gained as much from this experience as Eastern has from his being here.

Shane's most used web site: www.maccentral.com (up-to-date mac information)
Shane's e-mail address: helios@jersey.net (feel free to write him with any questions)

A Picture is Worth a Thousand Words

by Michael Harrison

Whoever coined this old saying never tried to use a picture in a classroom setting. While it is true that all students can clearly see the same picture if it appears in a textbook, enriching our students' experiences with pictures from other sources raises a serious logistical question: how can we get our students, all of our students, to see what we see? Holding up a picture in front of the room helps only the first two rows. Walking about

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the room with a picture or passing it around leads to a disjointed lesson with some of the students off task at any given time. The problem grows exponentially as the number of pictures increases. In addition, it is almost impossible to direct your students' attention to a particular aspect of the picture.

Now technology offers a new and exciting option - take pictures with an electronic camera and then use a Macintosh and the TV monitor in your room to show them to the entire class. Your pictures will be as large as the TV screen, the students can all view them at the same time, and, with the accompanying software, it is easy, and I mean easy, to focus in on specific elements of any picture.

... presently owns one electronic camera, the Apple Quick Take 100, and it plans to add several more updated versions in the near future. The Apple QuickTake 100, like all electronic cameras, does not take pictures in the "normal" sense, exposing film that must be chemically developed. Rather, it digitizes the image and stores it electronically until it is downloaded to a Mac. These stored pictures can be manipulated and modified, viewed on the computer screen, or shown on a TV monitor connected to your Mac. If it sounds like you need to be a computer nerd or a photography whiz to handle this process, you're wrong; taking the pictures is as simple as point and shoot. Downloading and manipulating them involves basic skills most of us already use on the Mac.

The Apple QuickTake 100 has a built-in automatic flash; it also has a manual override for the more skilled and adventurous. The camera has two resolution settings, standard and high. The standard setting allows you to take 32 pictures at a low resolution; the high, and I think far more useful resolution, allows you to take eight pictures. The camera has a port where a standard Mac cable can be connected to download the pictures to your computer and a button to erase the pictures stored in the camera so that more can be taken. Truly, my 35 mm camera is significantly more bulky and complex to use than the Apple QuickTake 100.

Once your pictures are on the Mac, they can be viewed like any graphics and, likewise, displayed on your TV monitor. The Apple QuickTake software that can be placed on your hard drive is clear and easy to use. The entire picture can be enlarged or made smaller, cropped, rotated, or viewed in a number of color or black and white resolutions. Finally, sections of the picture can be enlarged and manipulated. Anyone who works on the Mac with the most basic software should have no problems with the Apple QuickTake software.

Electronic cameras like the Apple QuickTake 100 open up a whole new way to bring pictures into the classroom. Newer versions of the camera will offer even higher resolutions and more options. If you are interested in trying the camera, see Ray Chojnacki or Kathy McCormick; for pointers or assistance in using the camera and related software, see me.

Below are two digital photos taken on recent Chemistry presentation visits to our sending districts. You will note that they have both been converted to duotones for purposes of publication in this newsletter. Nevertheless, they are still representative of the rather good quality available through current technology.

EBSCO*host*?

by Jim Garwood

The intention of this article is to be brief, to be generally informative regarding an online service now available in the E.H.S. Media Centers...and to prompt an interest in visiting this site. A visit is the only way to do justice to EBSCO, whose URL is:

http://www.epnet.com./about.html

What I expected to find at this site was an easy, new variation of the Readers' Guide... to which students could be directed for research purposes. What I actually found was *much* more than basic research information: One thousand "general interest" periodic publications are available in full-text form (for reference or casual perusal). Also available are hundreds of Business and Health Titles and quite a number of Childrens' Titles as well. There are enough periodicals at this

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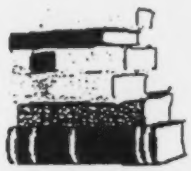


site to cater to the whims of casual readers *and* to satisfy the needs of serious research students for high school level and beyond.

A visit to the site with an eye towards educational applications yielded intriguing results. Among the "libraries" available were "The Academic Community" (apparently college level and above), "The Corporate Library," "The Medical Library," and of more interest to teachers, "The School Library." There are also buttons which lead to free trial offers for CD Roms and "Free Goodies."

While at EBSCO, I took the opportunity to download a set of "sample" lesson plans dealing with a current controversial topic. Procedures incorporate cooperative student groups, hands-on internet experiences, and optional cross-curricular activities can be developed. I have these on disk and will be happy to share them with anyone who would like to look them over.

Why not visit EBSCO and see all that is available?

What If Dr. Seuss Wrote Technical Manuals?

If a packet has a pocket on a socket on a port,
And the bus is interrupted as a very last resort,
And the address of the memory makes your floppy disk abort,
Then the socket packet pocket has an error to report!

If your cursor finds a menu item followed by a dash,
And the double clicking icons put your window in the trash,
And you data is corrupted 'cause the index doesn't hash,
Then your situation's hopeless and your system's gonna crash!

If the label on your cable on the gable on your house,
Says the network is connected to the button on your mouse,
But the packets want to tunnel to another protocol,
That's repeatedly rejected by the printer down the hall.

And your screen is distorted by the side effects of Gauss,
So your icons in your window are as wavy as a zouse,
Then you may as well reboot and go without a bang,
'Cause as sure as I'm a poet, the thing is gonna hang!

When the copy of your floppy's getting sloppy on the disk,
And the microcode instructions cause unnecessary RISC,
Then you hafta flash your memory, and you'll want to RAM your ROM,
Quickly turn off your computer and be sure to tell your mom.

The entire et.com staff wishes you all a very relaxing and regenerative Summer Vacation. We look fowaid once again to serving your interests and needs during the 1997-98 school year.

BEST COPY AVAILABLE

APPENDIX D

PERMISSION TO USE NEWSLETTER

Interoffice Memo

TO: Ray Chojnacki
FROM: Anne Price
DATE: 10-29-97
SUBJECT:

I would like to use some information in one of the et.com newsletters for a paper I'm writing. To comply with ethical guidelines I need permission. Is it O.K. to use it?

O.K. to use
R. Chojnacki

I believe all you really need to do is cite the source.

BEST COPY AVAILABLE

APPENDIX E

WORKSHOP EVALUATION FORM

EVALUATION
INTERNET RESEARCH WORKSHOP

Circle the response which best corresponds to how you feel about the following statements.

1. The information and materials provided were relevant to me.

   Circle a number

5	4	3	2	1
Strongly Agree				Strongly Disagree

2. How do you rate the workshop's level of difficulty?

   Circle a number

5	4	3	2	1
Too Difficult		Just Right		Too Easy

3. Do you intend to use what you learned today in working with your students?

   Yes No Not Applicable

4. Are you interested in another workshop on this topic?

   Yes No

Comments:

APPENDIX F

INSTRUCTIONAL UNIT

INSTRUCTIONAL UNIT

IMPROVING THE STRATEGIES HIGH SCHOOL STUDENTS USE TO CONDUCT RESEARCH ON THE INTERNET BY TEACHING ESSENTIAL SKILLS AND PROVIDING PRACTICAL EXPERIENCE

by
Anne F. Pierce
Ed.D Candidate, Nova Southeastern University

February, 1998

INTERNET RESEARCH
UNIT PLAN

OBJECTIVE:

Upon completion of the unit, the students will be able to:
1. Use Boolean operators to focus their search
2. Use nesting, truncation, and controls to focus their search
3. Use phrases effectively
4. Access full text articles from periodicals
5. Use subject directories when appropriate
6. Choose appropriate search engines

PROCEDURE:

Day 1
Administer pre-test

Teach search engines, subject directories

Day 2 and 3
Teach Boolean logic, wildcards, nesting, truncation, and controls

Think/Pair/Share Activity

Day 4 and 5
Hands on experience working in the media center computer labs

Students will be given a research question, or at the teachers' discretion, may develop a question of their own

As students work they will complete Internet Information Evaluation Forms

Day 6
Administer post-test

Day 7, 8, and 9
Students will evaluate the validity and reliability of the materials they have obtained based on the information contained in their completed Internet Information Evaluation Form

Students will prepare an outline of the facts they have acquired, and information about the sources from which it was obtained

Homework: Students will use the outline as the basis for a written report which will be submitted to the teacher

Day 10 and 11
Students will present the results of their research to their respective classes

MATERIALS:

Notes, Think/Pair/Share Activity, Pre/Post-Test

EVALUATION:

Informal assessment of student progress, comparison of post-test scores to pre-test scores

NOTES

ESSENTIAL SEARCH STRATEGIES

- **Boolean AND**: Narrows your search to include documents that contain both keywords (Example: Al AND Gore)
- **Boolean OR**: Broadens your search to include any of the keywords (Example: Chanukah OR Hanukkah)
- **Boolean NOT**: Narrows search by excluding one meaning of a word (cowboys NOT Dallas)
- **Nesting**: By combining Boolean words with parenthesis you can perform multiple tasks at once (Example: Saturn AND (car or automobile)
- **Truncation**: Searches on the root of the word adding different word endings or plurals (Example: Educat* searches educator, education, educational, educated . . .)
- **Controls**: By adding + or - in front of a word you are saying that the word MUST or MUST NOT be included in the results of your search (Example: Poccahontas - Disney [information about the woman NOT including the Disney movie]; Poccahontas + Disney [information about the woman in the Disney movie])
- **Phrase**: Use parentheses or quotation marks to search for a phrase or words that have a unique meaning when linked: (Example: "Wounded Knee" or (Westward Expansion)
- **Case sensitivity**: Most engines do not recognize capital letters (Example: Newt and newt, the politician and the salamander, are treated identically (Abilock, 1996)

The :-) is a smiley face - turn your head sideways - it means "just kidding" in Internet shorthand.

Abilock, D. (1996). Research on a Complex Topic. NUEVA library help. Available at: http://www.nueva.pvt.k12.ca.us/~debbie/library/research/adviceengine.html.

SUBJECT DIRECTORIES

CyberDewey
Organizes Internet resources using the Dewey Decimal system.

Lycos Sites by Subject
Provides access to the one tenth of the Web sites most linked to by users. It also has a Just for Kids section and a top five percent area.

Magellen
Provides access to thousands of sites reviewed by teams of editors and writers. Magellen does not review sites relating to pornography or hate groups. A Magellen green light indicates that the site does not have content intended for mature audiences. Sites are evaluated by depth, ease of exploration and "net appeal". Magellen uses + and - to include or exclude words.

Yahoo
This is one of the largest and most popular directories. It combines human and high tech search features to search the entire resource list or to focus within a narrow subject field.

SUBSCRIPTION DATA BASES - FULL TEXT MAGAZINE ARTICLES

Ebsco Host (http://www.epnet.con/ehost/login.html)
Full text magazine articles from a thousand or more periodicals are provided.

SIRS
Provides full text articles from over a thousand periodicals. It can be searched by keyword, subject, and title.

SEARCH ENGINES

Altavista
Highly rated for finding scientific information

Hotbot
Fast, powerful, and offers lots of pull down options for search refinement including the ability to limit by date, programming language, media type, file extensions (Example: .gif), geographic location, and Internet domain (Example: .com, . edu)

Excite
Uses a unique technology called ICE (Intelligent Concept Extraction); for example, when users search for "dog care" the engine knows that pet grooming is a related term. It is also good for reference areas such as its yellow pages, people finder, maps, shareware, and dictionary

Webcrawler
Default search engine for millions of AOL (America On-Line) users; it is often busy at peak times, special features include maps and find an address.

Infoseek
Contains Smart Info which features e-mail addresses, stock quotes, phone numbers, and company profiles; this engine allows natural language searching.

Valenza, J. K. (1997, May 29). Making search time on the Internet pay off. (tech.life@Inquirer section). Philadelphia Inquirer, pp. F1, F5.

NAME _____ DATE _____

MODS _____

ON-LINE SEARCH FORM

Subject _____ Teacher _____

Due date _____

Topic (be specific)

_____

_____

_____

Keywords to be used in the search (include synonyms, closely related phrases, scientific and technical terms)

_____

_____

_____

Search Strategy

List the search engines, databases, or subject directories which would be the most appropriate for starting your search.

_____

_____

_____

How many citations are needed? _____

NAME _____ DATE _____

MODS _____

INTERNET INFORMATION EVALUATION FORM

The first page of a web document should contain elements which assist in evaluating the information a document provides. Generally, this first page is set up with a header, body, and footer. Information about the author or contact person, the sponsoring institution, and the date of creation is the bare minimum which should be included. Some documents will also contain links to local home pages, explanations regarding the purpose of the information, and statements regarding the intended audience. Use the following format to assist you in determining the validity of Internet sources. Write in N/A for any information which is not available.

URL (Uniform Resource Locator/Internet Address)

_____

THE AUTHOR

Who is the author of the piece?

_____

What is his/her occupation?

_____

How many years of experience and/or education does he/she have?

_____

Based on the information available, or lack of it, is this person qualified to write about the topic?

(Circle one) YES NO

WEB PAGE SOURCE

What institution (company, government, university, or Internet provider) supports this website?

_____

Is it a national institution?

(Circle one) YES NO

Does the institution appear to filter information appearing under its name?

(Circle one) YES NO

Does the author's affiliation with this particular institution appear to bias the information?

(Circle one) YES NO

DOCUMENT INFORMATION

When was the information created or last updated?

_____

What appears to be the purpose for this information?

(Circle one) • Inform •Explain •Persuade

Explain your choice

_____

_____

Based on all the information you have determined, is this source appropriate for you to use?

(Circle one) YES NO

If you answered yes, explain why and indicate any reservations you may have about using this information.

_____

_____

Scholz, A. (1996). Evaluating world wide web information. [On-line], The Libraries of Purdue University. Available: http://thorplus.lib.prdue.edu/research/classes/gs175/3gsl175/evaluation.html

THINK, PAIR, SHARE ACTIVITY

1. Create a sufficient number of research questions to provide one question for every two students. Place each question on two index cards. Distribute the cards to the students.

2. Working individually, students are to complete an On-line Search Form for their research question.

3. Pair students who have the same question so that they can compare and discuss their work on the On-line Search Form. Have them complete a third On-line Search Form which represents their synthesized responses.

4. Each pair shares the results of their work with the whole group.

IDEAS FOR DOING INTERNET RESEARCH

Art

1. Search out museums and exhibits.
2. Search for clip art to use for a specific project.
3. Use a pictorial library to determine what something looks like. Pose the question, "What does a _____ look like? This is especially helpful with trees, butterflies, sailboats, and fire.
4. Research photographers and their photography.

Business

1. What are the current interest rates for mortgages?
2. Research a specific stock. Check stock prices.

Drivers Education

1. How do the Driving While Intoxicated (D.W.I.) laws in New Jersey compare to similar laws in other states.
2. How do motor vehicle fatalities compare to fatalities in other states? Which age group has the greatest number of fatalities?
3. Compare and contrast motor vehicle insurance in the least expensive state to motor vehicle insurance in New Jersey.

English

1. Explore the use of imagery in a Shakespearean play.
2. Research information on an author, historical period, or an author's work.
3. Find critical reviews of an author's work.
4. Find quotes from famous people regarding a particular topic.

Foreign Languages

1. Research information about a country's history, government, geography, or authors.

History

1. What caused the Civil War?
2. What recent court cases relate to Freedom of Speech?
3. Describe people and events in the early history of places such as Africa, China, Japan, India, or Latin America.

Home Economics

1. History: how the migration of people or war may have affected the eating patterns or type of food eaten. Example: In the early 1900's the Italians immigrated to the United States and brought with them tomatoes, pasta, and lasagne.
2. Geography and Agriculture: The farm land available, sea or fresh water, and climate all affect the type of foods readily available. Describe the land in a specific country. What foods are grown locally and/or what types of fish are caught in the area. Is the land suitable for producing animals for human consumption?
3. Staples and Seasonings: What foods do the people in a particular country consume on a regular basis and prepare in a variety of ways. Example: The potato is a staple for the Irish. The seasonings are those herbs and spices that give the food in a particular country or part of a country its character.

Math

1. Research the biography of a mathematician.
   Example: Find information about the life of Blaise Pascal.
2. Research how math is used in specific careers.
3. Investigate topics such as Non-Euclidean Geometries, Tessellations, Vectors, Logic, and the Platonic and Archimedian Solids.

Music

1. Research a style of music such as "Jazz" or "Swing" or "Rock 'n Roll".
2. Research the life of a composer
3. Research a specific piece of music.

Physical Education

1. Research fitness concepts.
2. Explore athletic records.
3. Investigate wellness topics.
4. Research the origin, history, rules, method of play, and factual information concerning the evolution of a particular sport.
5. Obtain information, plays, and scores from a professional sport played yesterday.

Science

1. Obtain the current Hubble data for a specific planet.
2. Access Educational Testing Service (ETS) data on the Advanced Placement (AP) Chemistry test answers to free response sections of past exams.
3. What is the most recent work done in any aspect of genetics?
4. Is science going faster than our laws and ethics review boards can handle?

Miscellaneous

1. Research careers.
2. Obtain job related information.
3. Have students research the career of their choice. Include information about duties, responsibilities, educational requirements, experience needed, salary range, working environment, and job availability.
4. What colleges offer a particular major?
5. What colleges have Division 1 sports?
6. What will the future be like in 50 years?
7. How does the Golden Ratio apply to nature?

The preceding ideas were compiled from responses to the teacher questionaire (see Appendix A).

APPENDIX G

INSTRUCTIONAL UNIT EVALUATION FORM

EVALUATION
INTERNET RESEARCH INSTRUCTIONAL UNIT

Circle the response which best corresponds to how you feel about the following statements.

1. The information and materials are relevant to the students needs.

   Circle a number

5	4	3	2	1
Strongly Agree				Strongly Disagree

2. How do you rate the level of difficulty of the materials?

   Circle a number

5	4	3	2	1
Too Difficult		Just Right		Too Easy

3. Suggestions for improvement:

APPENDIX H

NEWSLETTER

Improving the Strategies High School Students Use to Conduct Research on the Internet by Teaching Essential Skills and Providing Practical Experience

Internet Research Instructional Unit

The Internet Research Instructional Unit which was provided at the teacher workshop in February has been used with 15 special education students and 26 regular education, honors level students. The Pre/Post-Test "Searching Effectively on the Net" was administered prior to teaching the unit. Subsequent to teaching the unit and providing the students with practical experience, the test was re-administered to determine how much the students' knowledge of essential strategies, subject directories, and search engines had improved. The accompanying table provides a summary of the results. The mean, median, and mode were calculated as measures of central tendency; i.e., to come up with numerical representations of how the students performed as a group. While both regular and special education students improved, there was greater improvement on the part of regular education students. The standard deviation was calculated to determine the average of the differences between the distribution of scores and the mean. The larger the standard deviation, the more spread out the scores are. Conversely, the smaller the standard deviation, the less variation there is in scores. This is illustrated by the 76 point spread between the highest and lowest regular education students' scores on the pre-test compared to a 44 point difference for special education students. The associated standard deviations being 18 and 13 respectively. Finally, the correlation coefficient was computed to determine the relationship between students' scores on the pre-test and the post test. A correlation coefficient of 1 would indicate a perfect relationship between the two tests. If the correlation coefficient were 0 there would be no relationship between the two. The decimals in between are in proportion to the degree of the relationship between the two tests. Although none of the correlations was at .85 or higher, which was the goal set for this study, the correlation coefficients of .51, .35, and .68 do indicate a positive relationship between the tests and provide affirmation that students scores will improve through teaching them about searching on the Internet and providing them with practical experience.

Table of Results

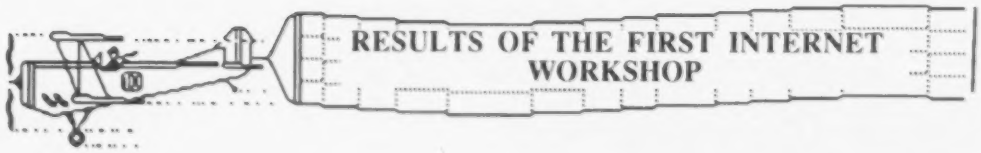
	Special Ed	Regular Ed	Total
Mean - Pretest	24	50	41
Mean - Post Test	61	94	82
Improvement - Mean	37	44	41
Median - Pretest	21	53	41
Median - Post test	65	86	65
Mode - Pretest	12 and 18	53	35
Mode - Post test	65	100	100
Standard Deviation - Pre	13	18	20
Standard Deviation Post	13	8	19
Correlation Co-Efficient	0.51	0.35	0.68
n =	15	26	41

DATE: Wednesday, April 22

TIME: 2:15 pm

PLACE: SHS Media Center

If you missed the first workshop or would like an additional opportunity to "surf the net" with assistance, plan to attend the second workshop on improving the strategies high school students use to conduct research on the Internet by teaching essential skills and providing practical experience.



Twenty seven staff members attended the workshop in February on conducting research using the Internet. Participants were provided with an instructional unit which included a) a form for evaluating information found using the Internet, b) an on-line search form for use prior to searching to facilitate the choice of topics, keywords, and strategies, c) a pre/post test to assess student knowledge of subject directories, search engines, and search strategies, c) a think/pair/share activity, d) ideas, organized by subject area, for doing Internet research, e) a brief description of the most popular subject directories and search engines, f) notes on essential search strategies such as the use of Boolean logic, g) a unit lesson plan, and h) websites which provide additional information regarding conducting research on the Internet.

Of the 27 staff members attending the workshop, 22 completed the evaluation form designed to assess the efficacy of the workshop. The first question asked if the information was relevant to the participant with a range of responses from five to indicate strongly agree down to one for strongly disagree. Twenty of the respondents strongly agreed the information was relevant to them. Twenty one intended to use what they learned in working with their students. And, 16 were interested in another workshop.

APPENDIX I

USEFUL WEB SITES

RESEARCH ON THE WEB
USEFUL WEB SITES

Based on her research on the Web, Debbie Abilock, the librarian at the Nueva School in California has created two web sites to assist you.

The first address provides detailed advice on "Research on a Complex Topic" and "Performing Precise Searches."

http://nueva.pvt.K12.ca.us/~debbie/library/research/research.html

The second address evaluates the Search Engines that best provide the information needed. She reviews the strengths and weaknesses of search engines that "index" the web and provides links to these engines.

http://www.nueva.pvt.k12.ca.us/~debbie/library/research/adviceengine.html